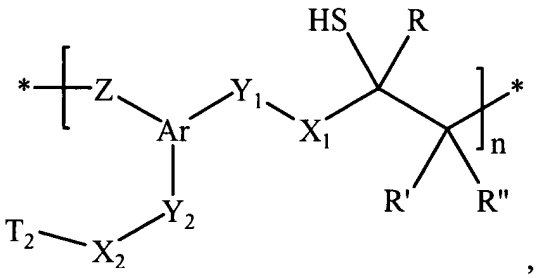
CLAIMS

What is claimed is:

1. An organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(a) a polymeric charge transport composition having the formula



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where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group;

R, R', R'', R_1, R_2, R_3, and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group;

Z is a bridging group; and

n is a distribution of integers between 1 and 100,000 with an average value of at least 2; and

(b) a charge generating compound.

2. An organophotoreceptor according to claim 1 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino

group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

3. An organophotoreceptor according to claim 1 wherein Z comprises a $-(CH_2)_k-$ group, where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g, R_h, R_i, R_j, R_k, and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group

4. An organophotoreceptor according to claim 1 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.

5. An organophotoreceptor according to claim 1 wherein X_2 and Y_2 are, each independently, a bond and T_2 is H.

6. An organophotoreceptor according to claim 5 wherein Ar comprises an carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, or a thianthrene group; X_1 comprises a methylene group; Y_1 is a $-CR_1=N-NR_2-$ group where R_1 and R_2 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group; and Z is O, S, an NR_5 group, or a CO_2 group where R_5 is H, an alkyl group, an alkenyl group, or an aromatic group.

7. An organophotoreceptor according to claim 5 wherein Ar comprises a carbazole group, a julolidine group, or an (N,N-disubstituted)arylamine group; Y_1 is a $-CR_3=N-$

$N=CR_4$- group where R_3 and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group; X_1 is a $-(CH_2)_3$- group, where two of the methylene groups are replaced by O, and an aromatic group respectively; and Z is O, S, an NR_5 group, or a CO_2 group where R_5 is H, an alkyl group, an alkenyl group, or an aromatic group.

8. An organophotoreceptor according to claim 1 wherein X_2 and Y_1 are, each independently, a bond; Y_2 is a $-CR_1=N-NR_2$- group where R_1 and R_2 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group; T_2 is an aromatic group; X_1 is a $-O-CH_2$- group; Ar is an (N,N-disubstituted)arylamine group, a carbazole group, or a julolidine group; and Z is O, S, an NR_5 group, or a CO_2 group where R_5 is H, an alkyl group, an alkenyl group, or an aromatic group.

9. An organophotoreceptor according to claim 1 wherein X_2, Y_1 and Y_2 are, each independently, a bond; T_2 is H; Ar comprises a bis[(N,N-disubstituted)amino]aromatic group; X_1 is a $-O-CH_2$- group; and Z is O, S, an NR_5 group, or a CO_2 group where R_5 is H, an alkyl group, an alkenyl group, or an aromatic group.

10. An organophotoreceptor according to claim 1 wherein Y_1 and Y_2 are, each independently, a bond; T_2 is a thiiranyl group; X_1 and X_2 are, each independently, a $-CH_2$- group; Ar comprises a bicarbazole group; and Z is O, S, an NR_5 group, or a CO_2 group where R_5 is H, an alkyl group, an alkenyl group, or an aromatic group.

11. An organophotoreceptor according to claim 1 wherein the photoconductive element further comprises a second charge transport material.

12. An organophotoreceptor according to claim 11 wherein the second charge transport material comprises an electron transport compound.

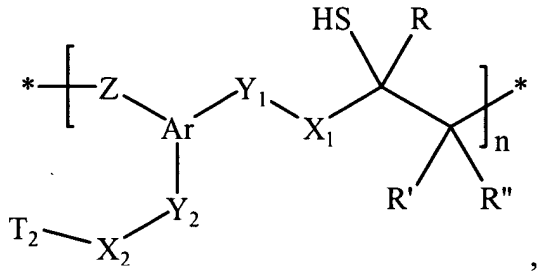
13. An organophotoreceptor according to claim 1 wherein the photoconductive element further comprises a polymer binder.

14. An electrophotographic imaging apparatus comprising:

(a) a light imaging component; and

(b) an organophotoreceptor oriented to receive light from the light imaging component, the organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(i) a polymeric charge transport composition having the formula



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where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group;

R, R', R'', R_1, R_2, R_3, and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group;

Z is a bridging group; and

n is a distribution of integers between 1 and 100,000 with an average value at least 2; and

(ii) a charge generating compound.

15. An electrophotographic imaging apparatus according to claim 14 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally

replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

16. An electrophotographic imaging apparatus according to claim 14 wherein Z comprises a $-(CH_2)_k-$ group, where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g, R_h, R_i, R_j, R_k, and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group

17. An electrophotographic imaging apparatus according to claim 14 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.

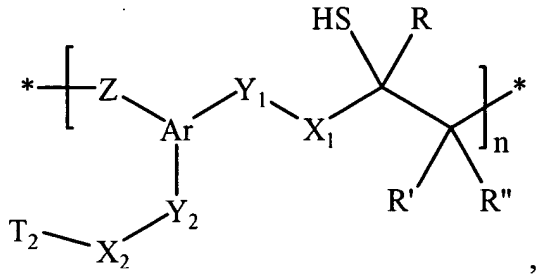
18. An electrophotographic imaging apparatus according to claim 14 wherein the photoconductive element further comprises a second charge transport material.

19. An electrophotographic imaging apparatus according to claim 12 further comprising a toner dispenser.

20. An electrophotographic imaging process comprising:

(a) applying an electrical charge to a surface of an organophotoreceptor comprising an electrically conductive substrate and a photoconductive element on the electrically conductive substrate, the photoconductive element comprising:

(i) a polymeric charge transport composition having the formula



where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group;

R, R', R'', R_1, R_2, R_3, and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group;

Z is a bridging group; and

n is a distribution of integers between 1 and 100,000 with an average value at least 2; and

(ii) a charge generating compound;

(b) imagewise exposing the surface of the organophotoreceptor to radiation to dissipate charge in selected areas and thereby form a pattern of charged and uncharged areas on the surface;

(c) contacting the surface with a toner to create a toned image; and

(d) transferring the toned image to a substrate.

21. An electrophotographic imaging process according to claim 20 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino

group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

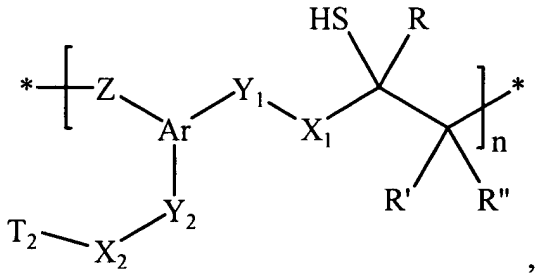
22. An electrophotographic imaging process according to claim 20 wherein Z comprises a $-(CH_2)_k-$ group, where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g, R_h, R_i, R_j, R_k, and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group

23. An electrophotographic imaging process according to claim 20 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.

24. An electrophotographic imaging process according to claim 20 wherein the photoconductive element further comprises a second charge transport material.

25. An electrophotographic imaging process according to claim 20 wherein the photoconductive element further comprises a polymer binder.

26. A polymeric charge transport composition having the formula:



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where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group;

R, R', R'', R_1, R_2, R_3, and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group;

Z is a bridging group; and

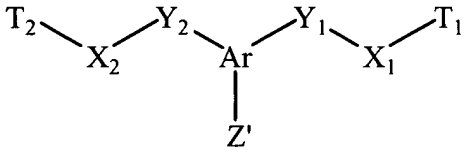
n is a distribution of integers between 1 and 100,000 with an average value at least 2.

27. A polymeric charge transport composition according to claim 26 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

28. A polymeric charge transport composition according to claim 26 wherein Z comprises a $-(CH_2)_k-$ group, where k is an integer between 1 and 30, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_g group, a CR_h group, a CR_iR_j group, or a SiR_kR_l where R_g, R_h, R_i, R_j, R_k, and R_l are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group

29. A polymeric charge transport composition according to claim 26 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.

30. A charge transport material having the formula:



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where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group where R_1, R_2, R_3, and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_1 comprises a thiiranyl group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group; and

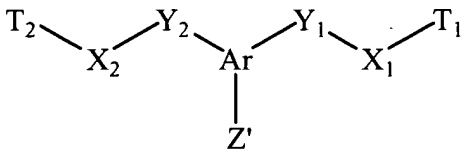
Z' comprises a reactive functional group that can covalently bond with the thiiranyl group under appropriate reaction conditions.

31. A charge transport material according to claim 30 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

32. A charge transport material according to claim 30 wherein Z' is selected from the group consisting of a hydroxyl group, a thiol group, an amino group, and a carboxyl group.

33. A charge transport material according to claim 30 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.

34. A method for forming a polymeric charge transport composition, the method comprising the step of polymerizing a charge transport material having the formula:



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where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group where R_1, R_2, R_3, and R_4 comprise, each independently, H, an alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_1 comprises a thiiranyl group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group; and

Z' comprises a reactive functional group that can covalently bond with the thiiranyl group under appropriate reaction conditions.

35. A method for forming a polymeric charge transport composition according to claim 34 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 0 and 20, inclusive, and one or more of the methylene

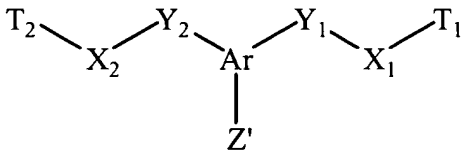
groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

36. A method for forming a polymeric charge transport composition according to claim 34 wherein wherein Z' is selected from the group consisting of a hydroxyl group, a thiol group, an amino group, and a carboxyl group.

37. A method for forming a polymeric charge transport composition according to claim 34 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.

38. A method for forming a polymeric charge transport composition according to claim 34 wherein the polymerizing step is initiated by the adjustment of the pH, the temperature, the concentration, or a combination thereof.

39. A method for forming a polymeric charge transport composition, the method comprising the step of co-polymerizing an acid anhydride and a charge transport material having the formula:



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where Y_1 and Y_2 are, each independently, a bond, a $-CR_1=N-NR_2-$ group, or a $-CR_3=N-N=CR_4-$ group where R_1, R_2, R_3, and R_4 comprise, each independently, H, an

alkyl group, an alkenyl group, a heterocyclic group, an aromatic group, or a part of a ring group;

X_1 and X_2 are, each independently, a linking group;

T_1 comprises a thiiranyl group;

T_2 comprises a thiiranyl group, H, an alkyl group, an alkenyl group, or an aromatic group;

Ar comprises an aromatic group; and

Z' comprises a reactive functional group that can covalently bond with the thiiranyl group under appropriate reaction conditions.

40. A method for forming a polymeric charge transport composition according to claim 39 wherein X_1 and X_2 comprise, each independently, a bond or a $-(CH_2)_m-$ group, where m is an integer between 0 and 20, inclusive, and one or more of the methylene groups is optionally replaced by O, S, N, C, B, Si, P, C=O, O=S=O, a heterocyclic group, an aromatic group, an NR_a group, a CR_b group, a CR_cR_d group, or a SiR_eR_f where R_a, R_b, R_c, R_d, R_e, and R_f are, each independently, a bond, H, a hydroxyl group, a thiol group, a carboxyl group, an amino group, an alkyl group, an alkoxy group, an alkenyl group, a heterocyclic group, an aromatic group, or part of a ring group.

41. A method for forming a polymeric charge transport composition according to claim 39 wherein wherein Z' is selected from the group consisting of a hydroxyl group, a thiol group, an amino group, and a carboxyl group.

42. A method for forming a polymeric charge transport composition according to claim 39 wherein Ar is selected from the group consisting of a carbazole group, a julolidine group, an (N,N-disubstituted)arylamine group, a bis[(N,N-disubstituted)amino]aromatic group, a bicarbazole group, a phenazine group, a phenothiazine group, a phenoxazine group, a phenoxathiine group, a dibenzo(1,4)dioxine group, and a thianthrene group.